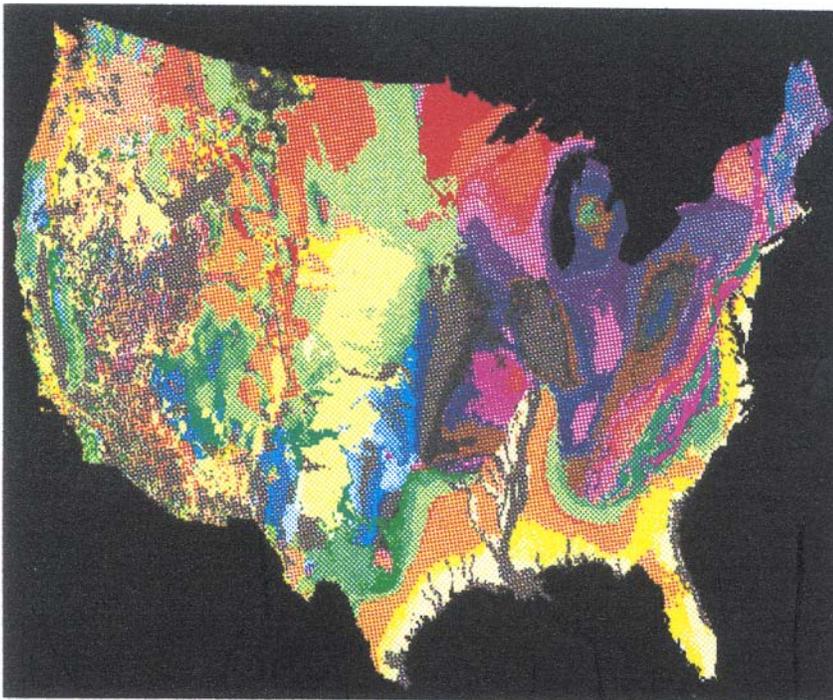


**Federal Advisory Committee**

**for the**

**National Cooperative Geologic Mapping Program**

**Annual Report - 1998**



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## **Review of the National Cooperative Mapping Program**

### **National Geologic Mapping Act of 1992 and National Geologic Mapping Reauthorization Act of 1997**

The availability and effective utilization of natural resources is fundamental to sustain human existence on planet Earth. A basic requirement for identification, delineation, and sustained use of earth resources, including water, mineral and biologic resources, is the availability of detailed geologic mapping. Unfortunately, less than 20 percent of the United States is adequately mapped to meet these needs and an even smaller fraction is mapped using digital technology.

Growing concern over effective stewardship of our environment is producing a myriad of rules and regulations directed toward maintaining and improving our habitat. The ultimate repository of our waste products is the earth, and geologic maps are needed to identify and delineate the rock units that are capable of containing them effectively.

As the population of the earth continues to increase, the effects of natural hazards loom even greater. The identification and mitigation of such phenomena require the use of detailed geologic maps. Increasingly, digital technology is needed to interpret three-dimensional geologic map data and to expedite decisions on the use of earth resources. Geologic maps are being integrated into digital Geographic Information Systems (GIS) that display the location and abundance of earth resources, risks from natural hazards, and the susceptibility of the surface and buried aquifers to contamination. As used in GIS, geologic maps constitute the basic earth materials framework on which all other information layers are built.

An assessment during the 1980's by the Association of American State Geologists (AASG) found that only 11,000 (18 percent) of the 59,000 7 1/2 - minute quadrangles covering the U.S. have been mapped in sufficient detail to be useful in addressing state needs for resource development, environmental protection, and natural hazard identification and mitigation. Only one state, Kentucky, has been completely mapped at a scale of 1:24,000, and even in that state revisions are needed. The latter point illustrates the need for not only complete the coverage of the nation, but also for an ongoing commitment to update and maintain the nation's geologic map information.

For these and a myriad of other reasons, the AASG in concert with the U.S. Geological Survey (USGS) began a planning process in 1988 to develop a geologic mapping program that would produce complete coverage of surficial and bedrock geologic mapping for the nation in a reasonable time frame.

At the outset, it was recognized that the nation has substantial but declining capability in geologic mapping. While the USGS and the state geological surveys are publishing detailed surficial and bedrock geologic maps, the rate of production will not provide adequate coverage of the needed areas in any realistic span of time. Furthermore, the numbers and capability of geologic

mappers in the U.S. are clearly on the decline. In recent years, colleges and universities have decreased their attention to field training, with many eliminating such requirements for a geology degree.

Based on these conditions, a plan was developed to introduce an authorizing bill to Congress to mandate production of complete surficial and bedrock geologic map coverage at a scale that would meet national and regional needs for resource development, environmental protection, and identification and mitigation of natural hazards. The nominal mapping scale that was adopted was that of the standard topographic quadrangle map (1:24,000).

The proposed authorizing bill placed the national management responsibilities in the USGS, with advisory support from other involved Federal agencies, state geological surveys, academia, and the private sector. The proposed program consisted of four mapping elements: a Federal mapping component, a Federal mapping support component, a state mapping component, and university field training component.

The Federal mapping component recognizes the current Federal mapping program that addresses national needs for geologic map coverage by the USGS and other Federal agencies. The Federal mapping support component encompasses the ongoing efforts of the USGS to develop and maintain related databases in stratigraphy, geochronology, paleontology, geophysics, and other areas. In addition, this component recognizes the need for the development of digital methods for managing and using geologic map data.

The state-mapping component is directed toward meeting those needs for detailed geologic maps at the state and local level. It is recognized that such needs carry some responsibility for state support as well. Thus, the state mapping component was established as a matching-funds program with one-half of the funding to be obtained from non-Federal sources.

The university field training support component is designed to address the national decline in geologic field training. Grants to academic institutions for augmenting graduate and undergraduate field training will be provided with the expectation of increasing the number of field geologists who are qualified to meet the needs of the expanded national geologic mapping program.

It was recognized at the outset that the passage of a bill authorizing the establishment of a national geologic mapping program would require the support of a broad constituency. While the USGS and the MSG have compiled impressive statistics concerning the needs and the status of detailed geologic mapping in the U.S., efforts at passage of such legislation would undoubtedly fail without a public response to support those identified needs.

To develop this public support, the AASG, through the state geological surveys, launched a major effort to identify companies, organizations, and individuals at the national, regional, state, and local levels. The results were impressive, and played a key role in passage of the authorizing legislation.

The authorizing bill was introduced into the Senate by Senators Johnston (Dem., LA), Bingaman (Dem., NM) and Craig (Rep., ID) on May 23, 1991, and into the House of Representatives by Congressman Rahall (Dem., WV),

Vucanovich (Rep., NV), Brewster (Dem., OK) and McCurdy (Dem., OK) on June 25, 1991. The state geologists, working through various state-level groups, were able to enlist a large number of co-sponsors for the House and Senate versions of the bill. At passage, the Senate bill (S. 1179) had 22 co-sponsors, and the House bill (H.R. 2763) had 48 co-sponsors. The result was that, following successful hearings, the bill passed both houses by unanimous consent and was signed into law on May 18, 1992, as Public Law 102-285, The National Geologic Mapping Act of 1992.

Public Law 102-285 provided authorization for the first four years of the National Cooperative Geologic Mapping Program. Authorization and appropriation levels are listed in the table below. Authorization for the program ended in fiscal year 1996. A reauthorization bill for fiscal years 1997 -2000 was passed by the House and referred to the Senate, but the bill was and died in the closing hours of the 104th Congress. Recognizing the value for cooperative geologic mapping, the President's budget request for FY 1997 included funding for the Geologic Mapping Program under the general funding authority for the USGS at the base level for FY 1997 (\$21.8 M). The President's budget request for FY 1998 again specified funding for the program, albeit at a reduced level (20.1 million dollars, an 8% reduction). The 104th Congress restored the proposed reduction for FY 1998 and funded the program at \$22.2 M, a slight increase over the previous year. Intense constituent interest in reauthorization of the Mapping Act was expressed early in the 105th Congress. Representative Cubin (Rep., WY) introduced a reauthorization bill for fiscal years 1998-2000 on February 12, 1997. Following a positive hearing before the House Resources Committee, Subcommittee on Energy and Mineral Resources, the bill was passed by the House on March 11, 1997 and referred to the Senate. The bill was passed by unanimous consent on July 23, 1997 and signed by the President on August 5, 1997 as Public Law 105-36, the National Geologic Mapping Reauthorization Act of 1997.

#### **Funding History -National Cooperative Geologic Mapping Program (Federal Dollars)**

FY	FEDMAP (and SUPPORTMAP)		STATEMAP		EDMAP		Total (Federal Funds)	
	Auth	Appr.	Auth.	Appr.	Auth.	Appr.	Auth.	Appr.
1993	22.0	20.64	15.00	1.34	0.50	0	37.50	21.98
1994	24.0	21.17	18.00	1.84	0.75	0	42.75	23.01
1995	26.5	20.63	21.00	1.34	1.00	0	48.50	21.88
1996	29.0	17.07	25.00	4.38	1.50	0.438	55.50	21.88
1997	n/a	17.07	n/a	4.38	n/a	0.438	n/a	21.88
1998	20.16	17.28	5.32	4.44	0.52	0.443	26	22.16
1999	21.66	n/a	5.78	n/a	0.56	n/a	28	n/a
2001	23.16	n/a	6.24	n/a	0.60	n/a	30	n/a

Values are in millions of dollars. Auth. = Amount authorized. Appr. = Amount appropriated. n/a = not available.

#### **Activities of the Federal Advisory Committee (1996-1998)**

The Advisory Committee first met on April 24-25, 1996 to review the status of the program and its Implementation Plan, discuss plans for the future, and to form working groups. During the year, the working groups made recommendations for the future of the program, revised the Implementation Plan and evaluated the state and university Requests for Proposals. The Implementation Plan and the Annual Report for FY 1996 were submitted through the USGS and the Secretary of the Interior to the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate, as stipulated in the Mapping Act.

The Advisory Committee determined that except for an increase in funding, all components of the program, as authorized by Public Law 102-285 had been implemented. Future plans focused on increasing partnerships between Federal, state, university, and private-sector groups in the production of geologic maps and in the construction of the National Geologic Map Database. Recommendations were made on how to integrate national, state and local priorities in the selection and funding of projects, and on ways to address the shortage of trained geologic mappers. Each of these efforts was directed at increasing the effectiveness of geologic mapping and providing geologic map information for the solution of earth science problems that are critical to public safety, and in balancing resource, environmental, and land-use issues.

The Committee met again on April 3, 1997 for the annual review of the progress of the Mapping Program and to review the Program's new five-year plan, which was outlined at a planning workshop with constituents during February, 1997. The committee heard updates on the status of the National Geologic Map Database, on progress of the matching-funds programs with the state surveys and universities, and on Federal and support mapping activities. The committee also provided written review comments on the program five-year plan during the following year. The comments were incorporated in the revised five-year plan, which is used as the basis for setting priorities and for reporting progress under the Government Performance and Results Act.

The committee met most recently on April 15-16, 1998 to review the program Implementation Plan and progress made during the previous year. In addition, the committee reviewed the National Geologic Mapping Reauthorization Act of 1997 and planned improvements to the Mapping Act in anticipation of reauthorization for fiscal years 2001-2005. The committee also commented on revisions to the program five-year plan to bring the plan into alignment with the USGS Geologic Division's new Science Strategy, and with Department of Interior priorities. The committee also discussed how the program could better meet the needs of other Federal agencies, the states, the private sector and academia. The 1998 recommendations of the committee are summarized in this report.

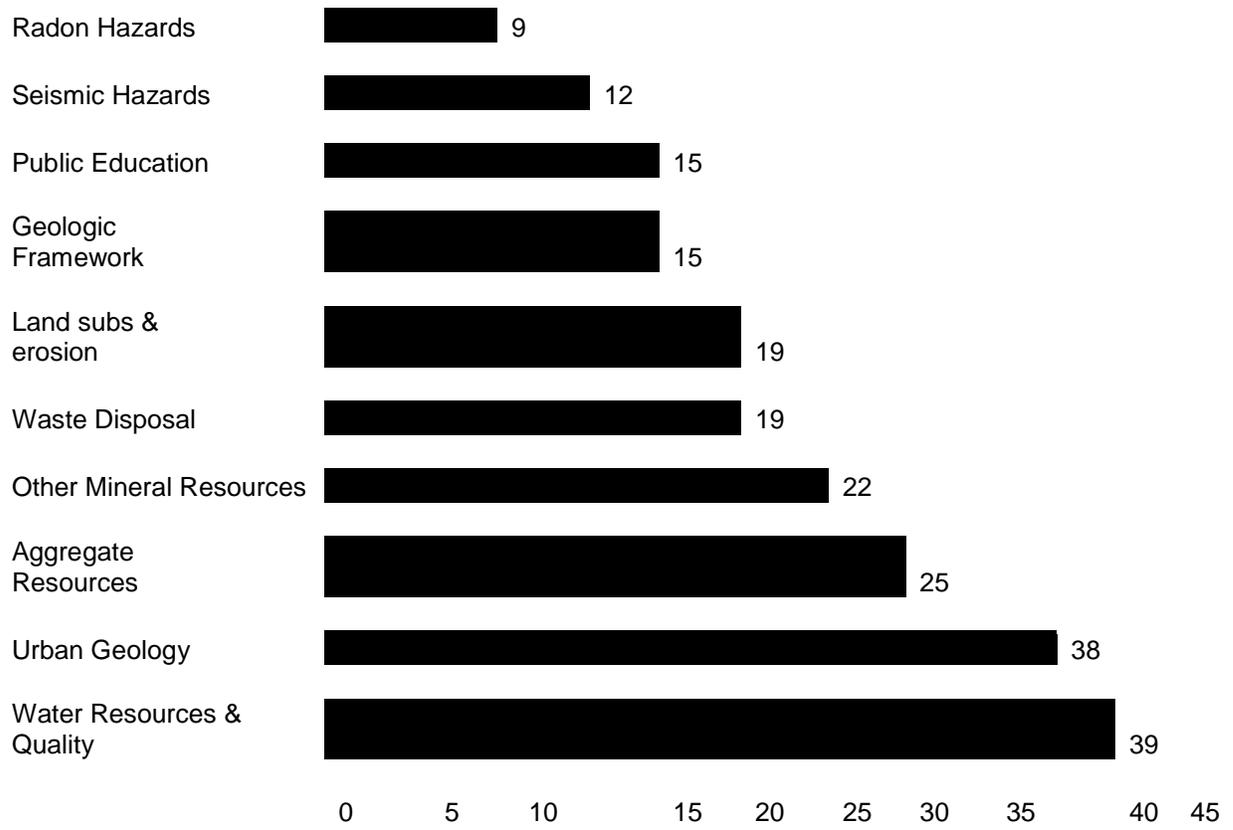
## **The Matching-funds components: STATEMAP and EDMAP**

The matching-funds program components with state geological surveys (STATEMAP) and with universities (EDMAP) were fully implemented in fiscal year 1996. Federal funding for the STATEMAP component increased in fiscal year 1996 to approximately \$4.4M, more than three times the funding level in fiscal year 1995. The distribution of funds between the Federal and matching-funds components followed the allocation set out in the Mapping Act. The EDMAP matching-funds cooperative with universities was implemented for the first time in FY 1996, with the mandated funding level of approximately \$440K. Funds were derived through decreases to the Federal mapping program component (FEDMAP). Funding was maintained at these levels in fiscal year 1997, and increased slightly in fiscal year 1998 as a small increase was distributed according to the provisions in the Mapping Act.

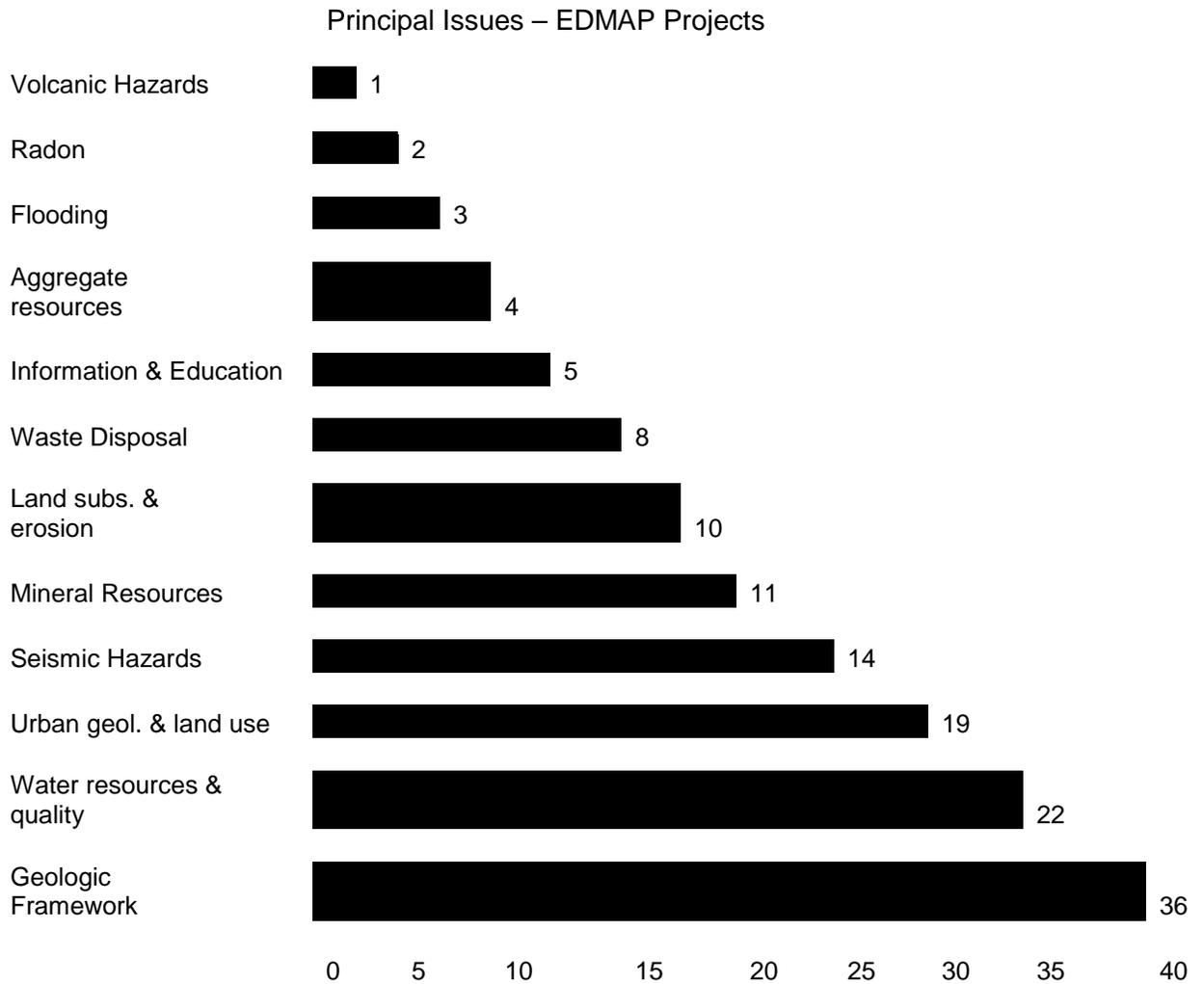
The number of state geological surveys participating in the STATEMAP component has increased each year. In 1998, matching funds were provided for approximately 150 geologic mapping projects in 43 states. State Mapping Advisory Committees are in place in all participating states and are composed of more than 500 geologic map users from the public and private sectors. These committees set priorities for geologic mapping within each state and rank the top geologic mapping project proposals to forward to a national awards panel managed by USGS. The awards panel, which consists of representatives from the state surveys, universities, and the USGS, evaluates proposals for matching funds awards. Since 1996, forty-eight states have participated in STATEMAP with well over 200 geologic mapping projects receiving matching funds. Many of these mapping projects have produced multiple geologic maps, thus contributing hundreds of new geologic map products. Likewise, since 1996, sixty-eight universities have received matching funds from EDMAP to train over 130 graduate students to produce geologic maps. Similarly, participation in EDMAP has increased during the first three years of implementation. In 1998, 52 graduate students at 40 universities in 26 states received matching funds from EDMAP. All EDMAP proposals are endorsed by and coordinated with state geological surveys or USGS projects that have a geologic mapping component. Matching funds are awarded by the USGS on the basis of recommendations of an annual awards panel. The panel consists of representatives from universities, state geological surveys, and the USGS.

Issues addressed by STATEMAP and EDMAP projects are well aligned with priority needs for geologic mapping as identified by map users in the state, and include mapping in support of: ground-water resources, land-use planning, aggregate and other mineral resources, and natural hazards, as shown in the charts that follow. A larger proportion of the EDMAP projects address basic research issues, such as the resolution of questions about the geologic framework of various regions of the nation. This focus is consistent with the overall training mission of the EDMAP component, that is, to address the shortage of well-trained field geologists by providing experience in geologic mapping.

### Principal Interests – STATEMAP Projects



The chart above shows the distribution of principal issues addressed by proposals to the STATEMAP program component in 1997. Because geologic maps often address more than one issue, each of the 43 individual mapping proposals was attributed to one to nine issue categories.



The chart above shows the distribution of principal issues addressed by proposals to the EDMAP program component in 1997. Issue categories were assigned as in the previous chart.

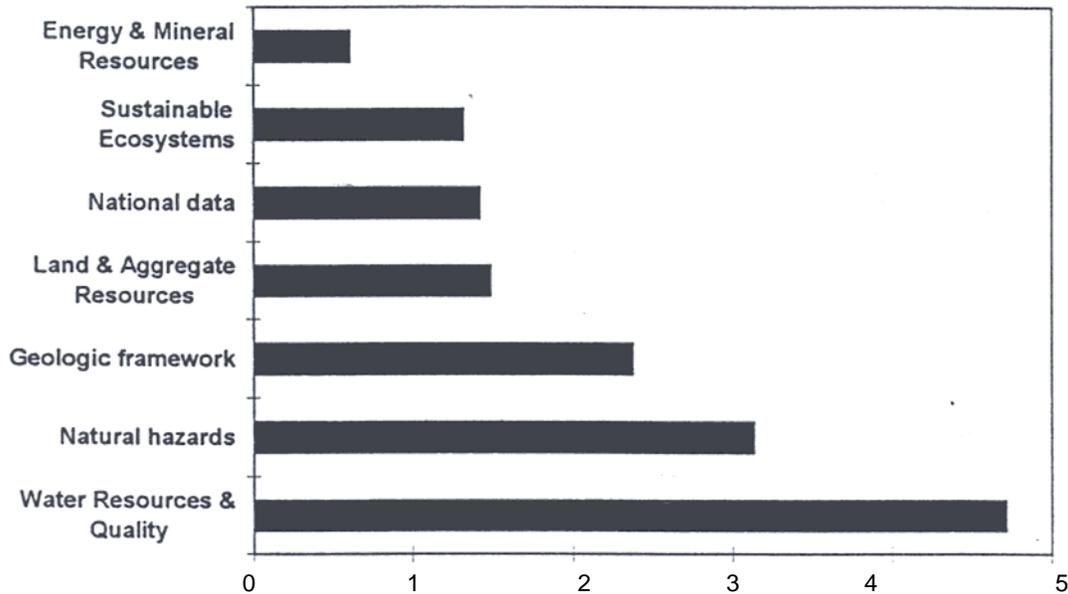
Each year, the national awards panels for STATEMAP and EDMAP make recommendations for changes to these program components. When appropriate,

changes are made to the annual Request for Proposals (RFP). Recent changes include: revision of the EDMAP RFP to emphasize the training mission of the component, as specified in the Mapping Act; changes in the language of the STATEMAP RFP to encourage state surveys to limit overhead charges to eighteen percent or less, and changes recommended for the fiscal year 1999 RFP, to extend eligibility to Senior undergraduates to apply for matching funds to support geologic mapping as components of senior thesis work. The Federal Advisory Committee prior to implementation reviewed each of these changes.

#### The Federal mapping and support components: FEDMAP

The focus and scope of FEDMAP geologic mapping projects changed dramatically during the 1990's. These changes were based on assessment of stakeholder needs for maps and followed recommendations of a National Research Council study that took place in 1985, and the steps outlined above that led to the National Geological Mapping Act. Federal project evolution continues, and incorporates annual recommendations from the Federal Advisory Committee. Additional input was obtained from map users and stakeholders at a National Geologic Mapping Forum and five-year Planning Workshop with stakeholders in 1997, and at three Regional Geologic Mapping Forums that brought clients and stakeholders together with project personnel during 1997. New projects are developed in partnership with partners from other DOI and Federal agencies (e.g., NPS, DOE, EPA, and others), and with state surveys. Ongoing projects are undergoing mid-term reviews by program managers, senior scientists, and external partners. A council consisting of USGS managers and scientists, and representatives from state surveys and the National Park Service reviewed all FEDMAP projects on a regional basis in 1996. In June of 1998 representatives from state surveys, universities, and the private sector participated in the annual FEDMAP program council, where priorities for ongoing projects and new Federal mapping proposals were evaluated. As illustrated in the chart below, FEDMAP projects address multiple issues, with geologic mapping as the framework for understanding water and hazard issues receiving the highest funding priority.

## Principal Issues – FEDMAP Projects



The chart above shows the distribution of funding (in millions of dollars) allocated to address principal issues by FEDMAP projects. Because geologic maps address multiple issues and future uses cannot all be anticipated, funding for each of the projects was apportioned into the above seven broad categories according to the principal issues that the mapping is needed for today.

The FEDMAP component has developed a new focus in near-surface geologic mapping, hydrogeology, and surficial geology. The program's emphasis on basement mapping has decreased, although this type of mapping continues where appropriate to define the framework for resource, hazards, and environmental issues. This change in focus came about as a consequence of tracking and responding to map user needs. Strong partnerships with state geological surveys, growth of cooperative mapping projects with USGS Water District offices, and advice from stakeholders directed the program into the near surface. Several projects within the Federal mapping program have conducted regional forums for geologic map users to obtain independent feedback on customer needs. Program managers are also participating in a bureau-level customer service pilot study, which will be part of the USGS1998 Customer Service Report.

The National Geologic Map Database, as mandated by the Mapping Act, was implemented as a digital database, beginning in 1996. The initial phase of the database is an internet-based catalog of printed maps and mapping in progress in USGS, state surveys, academia, and industry. The index is on the Internet and is being populated with metadata (as of 5/98 the catalog indexes approximately 50% of USGS holdings). The second phase of the project is to provide access and delivery of digital map data on the Internet. In order to deliver digital map data in a form that facilitates GIS use,

standards and data models are being developed in partnership with a variety of USGS programs, with state surveys, and with the Geological Survey of Canada.

In order to better serve Department of Interior needs for geologic information, FEDMAP is the primary partner with the National Park Service in the "Science in the Parks" initiative. Priorities for mapping projects to address NPS issues were determined by NPS in 1995; and an initial suite of more than a dozen mapping projects, with a total funding level of \$2M, began in 1996. This funding level has been maintained in 1997 and 1998. New projects and changes in these FEDMAP project priorities are continuously coordinated with NPS, through the NPS-USGS liaisons at the program and field operations levels. Geologic mapping projects are providing unbiased framework information on issues that range from potential impacts of lead mining on ground water in the Ozark Mountains to habitat preservation in Death Valley.

FEDMAP has dramatically increased its interactions and leveraged its resources with state agencies and other USGS programs. This is perhaps most evident in cooperative project work with the Ground Water Resources, National Research (NRP) and Cooperative Research programs of the Water Resources Division (WRD), and with the Bureau Ecosystem program. Cooperative projects include: 1) the Middle Rio Grande Basin Project (with the WRD District office in Albuquerque, NRP, Ground-water Resources, New Mexico Bureau of Mines and Mineral Resources, City of Albuquerque, and others), 2) the Southeast Coastal Plain Project (with the South Carolina WRD District and the SC-DNR), 3) the Southern California Areal Mapping Project (with the California Division of Mines and Geology), WRD District Office, and Mojave Water Agency), 4) the Las Vegas Urban Corridor Project (with the Las Vegas WRD sub-District), and 5) the South Florida Ecosystem Project (with the Florida state survey, and with a variety of USGS and other Federal and state partners). Strong cooperation with other Divisions and with Geologic Division programs is also a major factor in the success of several FEDMAP projects: Urban Hazards in Puget Sound, Ozarks Scenic River project (with Mineral Resources and the MO-WRD-District), and infrastructure project and mapping areas of urban expansion and land subsidence in Colorado (with the Mineral Resources Program and the Colorado Geological Survey). In addition, cooperation with a variety of USGS programs and Divisions is ongoing (e.g., Climate History, Mineral Resources, and Biological, Water, and National Mapping Divisions) in developing the USGS Mojave ecosystem initiative. The initiative-driven efforts have a demonstrated need for geologic mapping, and a need for earth science work that addresses multiple issues. Consequently, they provide opportunities for growth of joint work involving all program components and with partners within AASG and other agencies.

Federal mapping projects in the San Francisco and Los Angeles areas led to strong cooperation with the USGS Landslides and Earthquakes programs and with state and county agencies in responding to hazards related to the 1997 -98 El Niño weather pattern. This, and ongoing joint work with the Landslides program in the Appalachians suggest that a new landslides initiative could be developed with stakeholders and partners. Cooperative work with the Minerals Program is improving the assessment of the economics of aggregate resources and their relation to urban growth in the Washington-Baltimore urban corridor.

FEDMAP is also contributing to the new Center for Earth Science Information Research (CESIR), a cooperative effort with Stanford University and other partners that

began in 1996. The mission is to develop geologic and economic methods to assess the value of earth science information. CESIR grows out of an effort to assess the value of geologic map information that was done at the request of the Office of Management and Budget in 1991 to analyze the need for geologic map information. This initial response resulted in the publication of "Societal Value of Geologic Maps"; USGS Circular 1111. Since 1992, more than 10,000 copies have been distributed. New partnerships and joint studies have been established with a number of projects and programs in USGS as a result of a series of short courses on the value of earth science information held during 1997. These range from assessing the economic consequences of ground shaking and liquefaction during earthquakes in California (with the California Division of Mines and Geology) to studies of the economic impacts of ground water contamination.

FEDMAP projects are also garnering significant outside funding to supplement Federal funds where priorities are well aligned with program goals. The program has long had a strong partnership with the Department of Energy at the Nevada Test Site and Savannah River Site. This effort was shrinking in 1995, but has rebounded and grown in 1997 and 1998. FEDMAP projects have been charged to develop new sources of funding in order to maintain a healthy balance between appropriated and outside funds, while maintaining a commitment to unbiased science. Through numerous funding agreements with the geologic mapping teams, outside funding amounts to approximately 15% of the FEDMAP budget. International mapping opportunities are also being explored.

FEDMAP is aggressively developing new opportunities for Federal, state, and academic partners through the DOI Initiative process. Starting in 1996, program managers and FEDMAP scientists met with State Geologists and their staffs from the Great Lakes states to begin developing an initiative for geologic mapping and hydrogeology. Also in 1996, FEDMAP managers began work with the USGS Water Resources Division on a cooperative initiative to address national and local issues related to hydrogeology and ground-water resources. Both of these efforts continue to grow. The Great Lakes Geologic Mapping Coalition is a result of a public forum on geologic mapping needs held during 1997 in Indianapolis and attended by 190 participants from 70 agencies. The coalition is now a partnership between the USGS and the state surveys of Indiana, Illinois, Ohio, and Michigan, and includes an ongoing 5-survey pilot project. The Coalition has prepared a prospectus and a draft USGS Circular for a long-term geologic mapping partnership in the region, has briefed Congressional delegations from the four states, and sponsored a workshop with managers of Region V, EPA. Coalition partners continue to consult with state and local map users and partners. Recent meetings with the University of Indiana and Purdue, which included participation by the Federal Advisory Committee academic representative, indicate an interest among the upper Mid- West universities in designing a training program in surficial geology and GIS to complement the Coalition effort.

Cooperation with the Ground-Water Resources Program led to a new initiative for expanded work in fiscal year 2000, as well as mutual coordination of the FEDMAP component of the Middle Rio Grande Basin project and cooperation in developing other projects of mutual interest. Promising areas for future USGS-state coalition work include geologic mapping and hydrogeologic studies of basins in the Southwest, studies of hydro-stratigraphy and salt-water intrusion in the Southeastern Coastal Plain, and

integrated geologic studies of river corridors. Program managers also participated in development of an initiative plan to address geologic issues along the nation's river corridors, and is planning the first steps in development of a digital mapping initiative with EROS Data Center.

FEDMAP has been an active partner with the Florida Geological Survey and a variety of other partners in supporting subsurface geologic mapping and paleo-ecological studies as part of the sustainable ecosystem study of South Florida. In addition, the program has participated in planning and GIS development for work in the Yellowstone National Park ecosystem and assumed a primary role in describing surface processes and their connections to biologic processes in the new Mojave ecosystem initiative. Finally, in addition to providing coordination for the Geologic Division, FEDMAP projects are contributing national-scale geologic map information for basement and surficial materials to the National Atlas of the United States.

## Findings and Recommendations of the Federal Advisory Committee to the U.S. Geological Survey

### Reauthorization Act of 1997 and plans for reauthorization for FY 2001

**Partial** On April 16, 1998, the Federal Advisory Committee reviewed the National Geologic Mapping Reauthorization Act of 1997 to determine if revisions should be made prior to the next reauthorization of the Act for the period starting in FY 2001. The committee made a series of suggestions as listed below and keyed to the sections of the Act.

**Section 2 -Findings of Congress:** The committee determined that the basic findings remain valid. It was noted, however, that the Act does not adequately address the importance of geologic maps in maintaining sustainable resources of all types (minerals, energy, water, and biologic resources). The committee recommended revisions that incorporate this concept, and that geologic map information must be integrated with other geospatial information to maximize usefulness. The committee also felt that the Act should stress the need to increase efforts in surficial geology and in use of emerging technologies for digital map production.

**Section 2, Subsection b -Purpose of the Act:** The committee had several suggestions: 1)The purpose of the Act should be moved to an earlier point in the document. 2) Use of the word "database" alone does not do justice to the national geologic mapping effort, and conjures up the wrong image for many readers. 3) The USGS role as the coordinator of national standards for geologic maps and for meta-data should be better defined. 4) Emphasis should be added on the role of the Act for stewardship of mapping and for education.

**Section 4, Subsection b, Part A** -The committee recommended that the terms "five-year plan" be substituted for "annual" and "national" plan, but that an annual review would be appropriate. It was recommended that the five-year plan be compatible with the requirements of the Government Performance and Results Act.

**Section 4, Subsection b -Responsibilities of the Survey:** The section should be rewritten to specify that the USGS responsibilities for reporting be met within the first year of reauthorization, or on an annual basis as appropriate, rather than specifying time limits of 300 days, 90 days and 210 days.

**Section 4, Subsection c, Part C** -The items (i.), (ii.), and (iii.) should be revised to be compatible with Subsection b.

**Section 4, Subsection 2, Part C -Program Objectives:** The committee found that the program is making adequate progress in each of the objectives, within the appropriated funding limits. However, the committee concluded that appropriated funding for the program is inadequate to meet the demand for geologic mapping.

The committee found that the program is making adequate progress in developing complementary geophysical, geochemical, geochronologic, and paleontologic databases; however, performance could be measurably enhanced by improving coordination on both an internal and external basis.

In the application of cost-effective mapping techniques, the committee believes that good progress is being made, but that there are no methods in place to allow a rigorous assessment of cost effectiveness. The committee believes that the program and its partners need to develop ways to make geologic maps more widely and easily usable.

In the development of public awareness, the committee concluded that the program and its partners should develop outreach plans that are better coordinated between Federal and state agencies, and academia.

**- Section 4, Subsection 2, Part d-1-Program Components- A Federal geologic mapping...** The committee found that the criteria for prioritization should be clarified, for example in a five-year plan; however, care should be taken to ensure that the criteria are not so

specific as to loose flexibility. Also, the need to coordinate with other Federal agencies was emphasized.

**Section 4, Subsection 2, Part d-2 -Program Components- A geologic mapping support component.** ...The committee recommends that the language be updated to show that the FEDMAP and SUPPORTMAP components are already combined and should simply be referred to as FEDMAP.

**Section 4, Subsection 2, Part d-3 -Program Components- A state geologic mapping component...** The committee recommends that this section be rewritten to parallel the construction of the FEDMAP component. It should be pointed out that standards for both FEDMAP and STATEMAP are the same and are being developed jointly by USGS and AASG. It was also recommended that the term "environment" be added to the list of justifications for geologic maps. The committee further recommended that program should explore the possibility of allowing other Federal agencies to participate in STATEMAP and EDMAP.

**Section 4, Subsection 2, Part d-4 -Program Components- A geologic education mapping component:** The committee determined that additional funds are especially needed for this component of the program, and that it should be emphasized that the prime purpose of EDMAP is to train the next generation of geologic mappers. The committee also determined that the current requirement for endorsement of projects by state surveys or by USGS is adequate for aligning priorities between program components, and that surveys should recognize that the prime role of EDMAP is education in geologic mapping. Contributing to the national geologic map database and addressing immediate societal needs are secondary goals for EDMAP.

**Section 5, Part b -Advisory Committee- Duties:** Item 1, "review and critique the draft implementation plan" should be revised to be consistent with suggestions for Section 4, Subsection b, Part A, and to acknowledge that the implementation plan was completed under the original authorization. Substitution of "annual review" should be sufficient.

**Section 6 -Geologic Mapping Program Implementation Plan:** As in Section S, this section should be replaced with a reference to the existing Implementation and S-year plans.

**Section 7 -National Geologic Map Database:** The committee recommends that, consistent with current USGS Geologic Division Science Strategy, the database should serve as a searchable index for all USGS Geologic Division data, in addition to serving as a distributed database that links to state survey geologic map metadata. The database should also access digital USGS map data, and the database should link to appropriate servers in states and other agencies.

**Section 9 -Authorization of Appropriations:** The authorization levels should be evaluated in subsequent years to determine if they should be increased under subsequent reauthorizations. The committee felt that the current manner of setting authorization levels between the program components is still appropriate, although the language dealing with increases above the base funding level could be simplified and reviewed for consistency.

## **Implementation plan**

**Partial** It was noted that the draft Implementation Plan was reviewed and finalized by the Federal Advisory Committee in 1996, and that the final version was submitted to the Secretary of the Interior and the Committees on Resources in the House and Senate at that time. The current advisory committee reviewed the Implementation Plan in the context of additional revisions that are needed under the 1997 reauthorization.

**Section 111-B-2- Advisory Committee:** This section should be revised to reflect the new composition of the committee under the 1997 reauthorization. It was further suggested that increased government and private sector representation could be obtained by seeking informal participation by observers.

**Section 111-B-3 -Proposal Review:** It was recommended that the FEDMAP program component include representatives from state geological surveys, universities, and from the private sector for annual project reviews. In addition, involvement of representatives from local groups, such as regional planning commissions may be appropriate for some reviews.

**Section IV-B-1 -Geologic Mapping Support Component:** The reference under this section that the states can contract for interdisciplinary support services from the Federal support component by "using funds from the STATEMAP component" should be eliminated, as it is in conflict with U.S. government policy on use of grant funds. A similar change should be made on the following page and under section IV-C-3-b should be eliminated. The committee recommends that alternative means be developed to support these activities in the state and university components.

**Miscellaneous:** The committee recommends that the primary function of EDMAP, to train the next generation of geologic mappers, should be added to the Implementation Plan. A section should be added that discusses the framework for developing regional (multi-state and USGS) coalitions for geologic mapping. A section should be added on mechanisms for measuring success of outcomes.

### **Alignment of Five-year and Implementation Plans with Geologic Division Science Strategy**

**Partial** The Advisory Committee reviewed the program's five-year plan in 1997. This committee reviewed "Geology for a Changing World -A Science Strategy for the Geologic Division" and a five-page "Draft Action Plan, National Cooperative Geologic Mapping Program, Geology for a Changing World, Science Goals, 2000-2010". The latter describes steps that are being taken by the program to respond to the Geologic Division strategy. The committee made the following recommendations for revisions to the Draft Action Plan:

The committee noted that the Geologic Division strategy specifies seven principal science goals for the Division and states that geologic mapping is "essential to achieving each of these seven goals." The committee believes that the action plan adequately describes how the program can respond to the seven goals, but notes that links to Climate Change and Ecosystems should be strengthened.

The committee suggests that a stronger focus on STATEMAP and EDMAP should be added to the action plan, and that the ability of the program to bring multi-disciplinary efforts to bear on earth science issues and links to other programs could be emphasized.

The committee suggests that examples of good interactions and coordination with EPA, USDA, DOE, and other Federal agencies should be added.

The committee believes that the seven categories of primary earth science issues addressed by FEDMAP projects are appropriate and align well with the Geologic Division goals.

The committee noted that many of the Geologic Division goals are focused on impacts of humans and population centers and recommends that the Geologic Mapping program should be driven first by issues, and mapping should be done in areas that require geologic information. Consequently, a focus on "urbanizing" areas and other areas of high environmental impact is appropriate.

The committee endorses the recent change in the FEDMAP prospectus for fiscal year 1999, in which geologic mapping support for the National Park Service is integrated into the seven primary issue theme areas being addressed by geologic mapping.

The Government Performance and Results Act (GPRA) pilot plan for the Geologic Mapping Program lists six separate goals for the program. A single goal that attempts to integrate the six goals has been drafted. This single goal is entitled: "Business Activity 5;" Land and Water Use." The committee reviewed the goals but did not reach consensus. Concern was expressed that having only one goal could put the program in jeopardy, however, it was recognized that multiple goals are likely to be impossible to track and to use effectively under GPRA, given the size of the program.

The committee endorses the use of regional workshops to assess map- user needs and to develop state-Federal partnerships and regional coalitions to leverage resources and support. In addition, the committee recommended that input from other Federal agencies be solicited when developing regional coalitions. .

The committee recognizes the potential difficulty in communicating the multi-purpose value of geologic maps in the public policy arena, when compared to singular issues such as disasters. Some winnowing and focusing on a smaller number of high-profile issues may help, but the committee recommends that a broad range of issues needs to be maintained when describing the uses of geologic maps. Differences in priority issues from one region of the country to another and between Federal, state, and private sectors require this breadth.

The committee recognizes the value that may accrue from exchange of professional positions from agency to agency, and to the degree it is mutually acceptable, the program should encourage exchanges of staff between the USGS and its state and academic partners.

The committee is aware of geologic mapping partnerships between program projects and private-sector firms. It is recommended that such partnerships for geologic mapping should only be developed where they are cost effective and appropriate for the issues. The program should also seek to increase its work on behalf of other Federal agencies.

### **Outreach and information dissemination on the value of geologic mapping**

**Yes** The Advisory Committee believes that the Geologic Mapping Program is relatively effective in communicating the value of geologic mapping to certain segments, such as Congress, but, the program should improve its outreach to the Department of Interior, the Executive Branch, and the public. A goal for the program should be to seek ways to align Geologic Mapping priorities that are shared by map users in the public with Executive Branch initiatives. In this manner, the cooperative partnership that is a foundation for the program could be effectively used to direct geologic mapping activities toward goals that are common to local and state priorities, and to Executive Branch priorities.

**Yes** Another area for improvement in outreach is to the public and the national media. Although many effective outreach activities are ongoing within individual projects, and by program partners, there are few national-level activities that communicate the value of geologic map information to the public and the media. The program should explore ways to better communicate this information to the national audience. It is recommended that program managers work with national organizations, such as the American Geological Institute, to improve this outreach component.

### **Recommendations concerning STATEMAP and EDMAP Requests for Proposals**

Several specific recommendations were forwarded to the Advisory Committee on behalf of the STATEMAP and EDMAP awards panels. These minor changes for the Requests for Proposals recommended by both STATEMAP and EDMAP review panels were endorsed by the committee.

**Yes** The committee endorsed the EDMAP panel recommendation that starting with the fiscal year 1999 funding cycle, seniors in undergraduate colleges may be eligible for matching funds support for geologic mapping projects as part of their senior theses. The EDMAP review panel will consider the undergraduate applicants separately from the graduate student applicants, thus ensuring fair competition. An as yet undetermined, but small, percentage of total EDMAP funds will be allotted to undergraduate mapping on a trial basis.

**Yes** The committee also suggested that a mechanism be created to allow EDMAP panel members the opportunity to review the map products from previous years prior to making funding decisions in the current awards year and to provide feedback to the mappers and their faculty advisors.

**Yes** It was also the recommendation of the committee that an endorsement for a student-mapping project by either a state geological survey or the USGS not be taken as committing those organizations to publish the results.

### **Committee Actions and Plans-FY 1998-1999**

In addition to preparing this report, members of the Advisory Committee will be available to provide additional advice to the Director of the USGS and his representatives during the year, either individually or as a group, to address issues that affect the interests of the program. The next scheduled meeting of the Advisory Committee is set for April 7-8, 1999.

**NATIONAL COOPERATIVE  
GEOLOGIC MAPPING PROGRAM  
STATUS, PROGRESS, IMPLEMENTATION AND RECOMMENDATIONS**

**THE FEDERAL ADVISORY COMMITTEE  
OF THE  
NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM  
AND THE  
U. S. GEOLOGICAL SURVEY  
1998**

Cover: Preliminary Geologic Map of the Pahute Mesa 30' x 60' Quadrangle, Nevada By: Scott A. Minor, David A. Sawyer, Ronald R. Wahl, Virgil A. Frizzell, Jr., Steve P. Schilling, Richard G. Warren, Paul P. Orkild, Jeffrey A. Coe, Mark R. Hudson, Robert J. Fleck, Marvin A. Lanphere, WC Swadley, and James C. Cole 1993

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## **MEMBERS OF THE ADVISORY COMMITTEE**

### **Federal Agency Representatives:**

Beverly K. Hartline, Office of Science and Technology Policy

Jo Lynn Traub, Environmental Protection Agency

Edith Allison, Department of Energy

Carla Kertis, Department of Agriculture

### **State Geological Survey Representatives:**

Donald M. Hoskins, State Geologist of Pennsylvania

Charles J. Mankin, State Geologist of Oklahoma

### **Private Sector Representatives:**

Susan M. Landon, Thomasson Partner Associates, Denver, Colorado

### **Academic Representatives:**

Robert D. Hatcher, Jr., University of Tennessee

### **USGS Representatives:**

(Chair) P. Patrick Leahy, Chief Geologist

(Vice Chair and Executive Secretary) John S. Pallister, Program Coordinator,  
National Cooperative Geologic Mapping Program

## **EXECUTIVE SUMMARY**

This report is a review of the status, and a summary of recommendations, of a Federal Advisory Committee on the National Cooperative Geologic Mapping Program, as authorized by the reauthorization of the National Geologic Mapping Act of 1997 (Public Law 105-36). The Advisory Committee met on April 15-16, 1998, to overview the status of the Program and its implementation plan, and discuss plans for the future.

The Committee determined that except for an increase in funding, all components of the Program, as authorized by Public Law 102-285 have now been implemented. Future plans focus on increasing partnerships between Federal, State, University, and private-sector groups in the production of geologic maps and in the construction of a National Spatial Data Infrastructure (NSDI)-compliant National Geologic Map Database. Recommendations are made on how to integrate National, State and local priorities in the selection and funding of projects, and on ways to address the shortage of trained geologic mappers. These efforts are directed at increasing the effectiveness of geologic mapping and providing geologic map information for the solution of earth science problems that are critical to public safety, and in balancing resource, environmental, and land-use issues.

### **STATUS OF NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM**

The reauthorization of the National Cooperative Geologic Mapping Program (NCGMP) is authorized through the National Geologic Mapping Act of 1997. Through the Mapping Act, the Program has the mandate to produce multipurpose geologic maps of the country in cooperation with State geological surveys and acting through the American Association of State Geologists. The geologic mapping program is developed in consultation with a Federal Advisory Committee, consisting of representatives from the U. S. Geological Survey, other Federal agencies, State geological surveys, academia, and the private sector.

The NCGM Program has been designed so that the Nation will have the quantitative geologic map data needed to address tomorrow's problems. To this end, the following goals are being pursued:

- Produce geologic maps of the highest quality
- Continue to ensure that the maps address societal priorities and are produced in forms easily accessible and usable.
- Expand cooperative agreements with the State geological surveys, academic communities, other Federal agencies, and the private sector to enhance the output of map information and data.
- Develop a National Geologic Map database and make the data available through the Internet. Enhance the ability to produce digital as well as analog (paper) map products.

As charged by the Act, the U. S. Geological Survey (USGS) is the lead Federal agency responsible for planning, developing priorities, coordinating, and managing the geologic mapping program. . Geologic mapping activities under this Program are accomplished through four main subprograms: STATEMAP, a matching-funds cooperative with the State geological surveys to produce geologic maps; EDMAP, a matching-funds cooperative with Universities for training in geologic mapping; and FEDMAP/SUPPORTMAP, the federal geologic mapping and support investigations activities. Geologic maps produced under all elements of the NCGMP address all four USGS themes (hazards, environment,

resources, and information) and are considered as the framework for more detailed investigations of local issues by Federal, State, local governmental agencies and by the private sector. Priorities for the Program are established cooperatively with external mapping partners and with cooperators in other USGS programs. Planning and prioritization of program projects and review of the Program's four-year implementation plan are guided by the Program's public and private-sector interagency Federal Advisory Committee, and by the Program's five-year plan.

The Program has four major components with the following goals and priorities:

FEDMAP/SUPPORTMAP are components whose objectives are to determine the geologic framework of the Nation and to develop a national geologic map database. Mapping priorities are based on national requirements for geologic-map information in areas of multiple-issue needs or areas of compelling single-issue need; and in areas where mapping is required to solve critical earth science problems. Emphasis is placed on areas determined to be vital to the economic, social, or scientific welfare of the Nation. The USGS continues to be active in executing geologic mapping (FEDMAP) and supporting studies (SUPPORTMAP) of paleontology, stratigraphy, geochronology, isotope geology, geophysics, and geochemistry. The USGS geologic mapping program has moved from large numbers of essentially one-person projects to more integrated regional synthesis projects in which clients and cooperators are involved in the planning, implementation, and execution of project work. For this reason, much of the Program in geologic mapping has moved from rural and wilderness areas to the "urban corridor" and "urban fringe" areas, where competing land-use decisions benefit from improved geologic information.

STATEMAP: A component of the overall program that supports the States in cooperative agreements to produce geologic maps. The principal objective of the State geologic mapping component is to determine the geologic framework of areas vital to the economic, social, or scientific welfare of individual States. Mapping priorities are determined within individual states by State Advisory Committees and the highest priority proposals are forwarded to a peer panel consisting of representatives of the State surveys that are appointed to rotating terms by the American Association of State Geologists (AASG). Proposals are evaluated, prioritized, and funding levels recommended by the panel, which the USGS coordinates.

Federal funding for the

State component is matched on a dollar-for-dollar basis with non-Federal funds. In FY 1995 only about six percent of total program funding was available for matching by State geological surveys, whereas in FY 1996 and beyond a minimum of 20 percent of appropriated funds will be apportioned to the STATEMAP component, thereby increasing the amount of high-priority geologic mapping by individual states. Additionally, this had a significant impact on both the number and the type of geologic maps produced. For the first time in FY 1996, the Program supported digital compilation of existing geologic map data in the production of small- and large-scale geologic maps. Also, production of geologic maps based on new field mapping increased four-fold. In FY 1996, forty-two States were funded for approximately 60 mapping projects.

Coordination among many of the State Surveys and the NCGMP Data Base Project was initiated and the framework for building the Federal/State geologic map database is underway. A comprehensive draft document, USGS Open-File 95-525, outlining geologic map standards was distributed to the State Surveys for review. The results of the review will be used to generate a geologic map standards document to be used by the Federal, State and University partners funded by the NCGMP.

At present, the STATEMAP awards are made by a panel of five State Geologists, one each from the eastern, central, and western regions of the United States and two at-large members. The USGS provides

one advisor from each of the three regions to assist in coordination of the STATEMAP projects with ongoing FEDMAP projects, panel is coordinated by the USGS.

The EDMAP program component provides funding for academic research programs through cooperative agreements, and ensures the training of students in producing geologic maps. This important component of the geologic mapping program was implemented for the first time in FY 1996. Two percent of the total program funding is available for matching by universities. The funding is to help support graduate students to conduct geologic mapping in areas of priority to State or Federal agencies. These studies not only help increase the geologic mapping of high priority areas but also help train the next generation of geologic mappers. In FY 1996 cooperative agreements are being made with 37 universities to support 40 geologic mapping projects recommended for funding by a peer review panel consisting of experts in geologic mapping. The peer panel of five university scientists represents the eastern, central, and western regions of the country, along with two representatives from the State geological surveys and one representative from the USGS. The USGS and State representatives provide linkage to Federal and State projects and priorities, and the USGS representative coordinates and chairs the panel. Panel members selected by the EDMAP subcommittee of the NCGMP Advisory Committee must have a demonstrated strong background in geologic mapping and knowledge of regional geology. Proposals are evaluated, prioritized, and funding levels are recommended by the committee. The State Geological Surveys and the NCGMP Program facilitate the publication and distribution of geologic maps generated in field-based academic research programs. The EDMAP component also contributes to the educational capacity of academic programs that teach earth science students the techniques of geologic mapping and field data analysis that will permit them, as they become professionals, to critically evaluate the quality of geologic map data sets, even if they are not actively making maps as professionals.

#### Status of Private Sector contributions

In increasing numbers, both FEDMAP and STATEMAP subprogram activities are working with private-sector firms to help prioritize the objectives and to increase the economic usefulness and relevance of geologic maps. Such activities range from involving the users of geologic maps in the private sector (e.g., aggregate producers, urban planning and environmental planning/remediation firms) to participation of private sector representatives during program planning through the NCGMP Federal Advisory Committee. For example, at the local level, private-sector map users and geologic consulting firms were involved in workshops and planning sessions for the new Middle Rio Grande Basin Project and in program contributions to two new Bureau-wide Initiatives (Pacific Northwest Urban Hazards and Colorado Urban Corridor Infrastructure Initiative). Workshops with private-sector participation are in the FY 1997 for two FEDMAP projects (San Francisco Bay and Geology of Mid-Atlantic Corridor)

In addition, the NCGMP relies upon the private sector to provide a variety of services and products related to the cost of production and distribution of geologic maps. These services include:

- Acquisition of aerial photography and photographic processing
- Contracting geophysical surveys, including airborne surveys.
- Contracting for scanning and digitizing maps.
- Acquisition of base map materials and data from the USGS National Mapping Division (much of

which is produced by private sector firms). NMD has a goal (established by Congress) of utilizing private sector firms to perform at least 60 percent of the map production workload by the end of FY 1999.

In addition, the NCGMP intends to make increasing use of private sector firms in steps associated with the release and publication of data and information in map and digital forms. The conduct of interpretive field investigations, geologic mapping, and map compilation, for which private sector resources are limited, however, will continue to be performed by USGS geologists and geologists of the State Geological Surveys and academic institutions through cooperative agreements. Geologic maps are basic interpretive products upon which the private consulting industry relies to produce more refined, site-specific, derivative maps.

The STATEMAP subprogram also provides funds to the private sector for a variety of activities. These include:

Drilling- Several states are doing subsurface mapping and use contract-drilling firms for data acquisition.

Printing Maps- The cartography and printing of color geologic maps is almost always done by the private sector.

Digitizing and scanning- Many state surveys use contractors to digitize and scan maps for inclusion in the National Geologic Map Database.

Contract Mappers- Many state surveys are now using contract geologists to do field mapping. The source of these mappers is limited, and many of the states hire university professors and students for contract mapping during summer months.

Aerial photography- Almost all geologists who map use aerial photography. All of this imagery is acquired outside of state surveys, with most coming from private contractors.

IMPLEMENTATION PLAN-- The Implementation Plan for the 1992 National Geologic Mapping Act and the Reauthorization Act of 1997 was developed by the NCGMP in concert with State Survey geologists appointed by the AASG. Although Congressional appropriations have never met the authorized level, by FY 1996, the Program has fully implemented all other aspects of the Plan. The present Advisory Committee has reviewed the Implementation Plan for the FY 1998 through 2000. The plan is included in this document.

EXTERNAL ADVISORY COMMITTEE-- The U. S. Geological Survey sponsored two national workshops, one in December 1994, and a second in February 1995, to begin the process of soliciting advice on the planning and implementation of the geologic mapping program. Workshop participants were producers and users of geologic map information, including representatives from Federal and State agencies, academic institutions, and the private sector. A National Cooperative Geologic Mapping Program Advisory Committee has been chartered and appointed. It held meetings in 1996, 1997, and 1998. This report contains the results from these meetings and the deliberations of subsequent working groups.

NATIONAL GEOLOGIC MAP DATABASE--A draft of this database design has recently been released for comment via the Internet by creating a site on the World Wide Web (WWW). The Uniform Resource Locator (URL) for this site is "<http://wwwflag.wr.usgs.gov/ngmdb>". This web site is also linked to the recently created web site for the National Cooperative Geologic Mapping Program whose URL is

"http://ncgmp.usgs.gov". A critical element in database construction is the development, acceptance, and adherence to a certain level of standardization. The USGS is currently working with both producers and users of geologic map information to develop draft format, symbols, and technical attribute standards so that geologic map database information can be accessed, exchanged, and compared efficiently and accurately as required by Executive Order 12906 (59 Fed. Reg. 17,671; 1994), which established the National Spatial Data Infrastructure (NSDI).

#### OTHER PROGRAMMATIC DATABASES

**Geochronologic:** Geologic age dates throughout the country have been evaluated and compiled and are available on CD-ROM as Digital Data Series DDS-14. This data is presently being revised and updated to be more inclusive of the different types of geochronologic data.

**Geochemical and Geophysical:** A variety of geochemical databases have been prepared by the USGS Minerals Resources Survey Program. These include geographically referenced data that include all chemical analyses produced in USGS laboratories. Various geophysical maps for the Nation have been prepared and are available. These data include low-resolution magnetic and gamma-ray information.

**Paleontologic:** Two prototypes exist under the general category of paleontological information. A geologic names database is now available on CD ROM as Digital Data Series DDS-6 and it details the USGS stratigraphic names used in maps and reports. A second database includes fossil designations used by the USGS in all stratigraphic correlations. This database is also available on CD ROM and will be available on the World Wide Web.

USGS CIRCULAR 1111--"Societal Value of Geologic Maps", published in 1993, is an economic analysis by the geologic mapping program that describes geologic maps, a benefit-cost model for valuing geologic map information, and the economic issues associated with determining whether or not a geologic map is a public good. Nearly fifteen thousand copies have been requested since publication. This publication and similar studies are increasing public awareness of the utility (value in use) of geologic map information to issues of land use management.

**FEDERAL PARTNERSHIPS--** The NCGMP is developing a series of cooperative relationships with various Federal partners, in addition to our State and academic cooperators. The most mature of these is with the National Park Service (NPS). In 1995, the USGS and NPS signed a Memorandum of Understanding that outlined areas of interaction between the two agencies. The geologic mapping program responded by working with NPS during 1995 as part of their "Science in the Parks" initiative to direct a portion of the Program's geologic mapping and supporting activities toward priorities established by NPS. The NPS used a national project call and priority system to rank over 100 proposals for geologic work in FY 1996. The geologic mapping program has continued to work on geologic mapping projects in 10-15 parks each year since 1996. The geologic mapping program is currently in the process of fostering partnerships with other Federal agencies including Bureau of Land Management, U.S. Forest Service, Environmental Protection Agency, and Department of Energy.

# **IMPLEMENTATION PLAN FOR REAUTHORIZATION OF THE NATIONAL GEOLOGIC MAPPING ACT**

## **NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM**

### *A Plan for Implementation for a Coordinated Program of Geologic Mapping of the Nation*

#### **I. PROGRAM DEFINITION**

An association of geologic mapping investigations by Federal and State agencies and academia for the purpose of developing geologic map information for the Nation.

#### **II. PROGRAM OBJECTIVES**

To expedite the production of geologic maps for the Nation through coordinated geological, geophysical, and geochemical investigations that lead systematically to the following integrated databases that can be applied to resolution of issues related to land-use management, assessment, utilization and conservation of natural resources ground water management, and environmental protection:

- *National geologic-map database* at 1:100,000 scale and as original map data, at open-file or archival scale of 1:24,000 for most land regions of the United States as appropriate. Some regions, such as Alaska, will be mapped at smaller scales.
- *Supplementary earth-science databases*, including
  - National geophysical-map database
  - National geochemical-map database
  - National geochronologic database
  - National paleontologic database

#### **III. PROGRAM INFRASTRUCTURE**

##### **A. Program Components**

1. Federal geologic mapping component (FEDMAP)
2. Geologic mapping support component (SUPPORTMAP)
3. State geologic mapping component (STATEMAP)
4. Geologic mapping education component (EDMAP)

## B. Management Structure

The U. S. Geological Survey (USGS) is the lead Federal agency designated by authorizing legislation to coordinate management of the NCGMP. The USGS and State geological surveys cooperate with other Federal and State agencies, the public and private sectors and academia to develop the geologic map database for the Nation in the manner outlined below.

### 1. Geologic Mapping Priorities.

- a) Geologic mapping priorities for the National Cooperative Geologic Mapping Program shall be identified through coordination with Federal agencies, State and local governments, and industry.
  - Mapping Program shall be identified through coordination with Federal agencies, State and local governments, and industry.
  - The USGS will coordinate priorities for the FEDMAP and SUPPORTMAP components. The USGS will provide these priorities for the nationwide summary.
  - Each State geological survey, through a State geologic mapping advisory committee, will coordinate the priorities for the STATEMAP component within State boundaries. Each State will provide these priorities for the nationwide summary.
  - Mapping priorities for the EDMAP component are those identified by the Federal/State prioritization process.
- b) The USGS and State geological surveys will exchange results of the priority-setting mechanisms so that all parties can develop funding Initiatives to legislatures and funding proposals for appropriate components of the National Cooperative Geologic Mapping Program, all consistent with consensus priorities.

### 2. Advisory Committee

The Secretary of the Interior, acting through the Director of the USGS, with the advice and consultation of State geological surveys, shall appoint members of an advisory committee.

- a. Participants (Number of members and representation) Federal agencies (4; one each from the Office of Science and Technology Policy; the Department of Agriculture; the Department of Energy; and the Environmental Protection Agency).

U. S. Geological Survey (2)

Private sector (1; energy, minerals, hazards, environment)

University (1; eastern, central, western regions)

- b. Terms of appointments will be established to provide for an orderly rotation of members

#### 1. Role

- Review and critique the draft implementation plan prepared by the USGS
- Review the scientific progress of the geologic mapping program
- Submit an annual report to the Secretary that evaluates the progress of the Federal and State mapping activities and evaluated the progress made toward fulfilling the purposes of this Act

### 3. Proposal Review

Funding proposals to components of the Program will respond to identified priorities and will be reviewed by peer panels composed of scientists who both have published geologic maps of recognized high quality and have working knowledge of regional geologic, geophysical, and geochemical problems. The peer panels shall be separate and distinct from the Advisory Group (Item 111.8.2 above).

- a. Proposals to the FEDMAP and SUPPORTMAP components will be reviewed by a peer panel of qualified scientists from the USGS chaired by the Program Coordinator of those components. Representatives of other USGS Programs, State Geological Surveys, and university professors familiar with EDMAP will serve on the review panels.
- b. Proposals to the STATEMAP component will be reviewed by a peer panel composed of five scientists from State geological surveys (one each from the eastern, central, western regions of the country, and two from the Nation at large, selected by ballot of State geologists from a slate proposed by the MSG); and three scientists from the USGS (one of who will be the official responsible for the coordination of the STATEMAP component of the National Cooperative Geologic Mapping Program and who will act as Chair) and one university professor familiar with the EDMAP component of the Program.
- c. Proposals to the EDMAP component will be reviewed by a peer panel of five university scientists who represent the eastern, central, and western regions of the country; two representatives from State geological surveys, nominated by the President of the AASG; and one representative from the USGS who will be the official responsible for the coordination of the EDMAP component of the Program and one State Survey representative. Each committee member must have a demonstrated strong background in geologic mapping and knowledge of regional geology.

#### 4. Mapping Standards

The National Cooperative Geologic Mapping Program will use the draft scientific and digital geologic map standards developed by the USGS in cooperation with State geological surveys and distributed through the Geologic Data Subcommittee of the Federal Geographic Data Committee. These standards will facilitate the use, translation, and exchange of geologic information among all sectors of the mapping association and among map users.

#### 5. Annual Report

The Advisory Committee will submit an annual report to the Secretary on the progress of the geologic mapping activities.

The Secretary shall, within 90 days after the end of each fiscal year, submit an annual report to the Committee of the House of Representatives and the Committee on Energy and Natural Resources of the Senate describing the status of the nationwide geologic mapping program.

## **IV. FUNCTION AND MANAGEMENT OF PROGRAM COMPONENTS**

### **V.**

#### **A. Federal Geologic Mapping Component (FEDMAP)**

##### 1. Primary research objectives

- a. Determine the geologic framework of areas that are important to the economic, social, and scientific welfare of the Nation.

- b. Develop a National geologic map database at 1:100,000 scale. Geologic maps will be made at larger scales such as 1:24,000, as appropriate, to present more detailed data or to resolve special problems subsequently archived, and compiled at the 1:100,000 scale.
- c. Provide interdisciplinary support for Federal geologic mapping activities and, as contracted for by States using funds from the STATEMAP Component, for States' geologic mapping. Supporting studies in paleontology, geochronology, geophysics, and geochemistry will be incorporated into the National Geologic map Database.

## 2. Mapping Priorities

Priorities are determined by the USGS through coordination with:

- Federal agencies
- State agencies
- Public and private sectors

## 3. Mapping Implementation

- a. Proposals are developed by scientists of the USGS in response to national priorities.
- b. Proposals are reviewed by a peer evaluation panel as described above (Item III.B.3.a).
- c. Geologic mapping is conducted by scientists of the USGS.
- d. The program component will produce geologic map information to meet standards and formats common to all Federal and State geological surveys.
- e. The USGS will publish geologic maps resulting from the investigations.

## 4. Funding

Line-item appropriation from the U. S. Congress to USGS for expenditure by the USGS

## **B. State Geologic Mapping Component (STATEMAP)**

### 1. Primary Research Objectives

- a. Produce geologic maps of areas that are important to the economic, social, and scientific welfare of the State and the Nation.
- b. Contribute geologic mapping to the National geologic map database at a uniform scale (1:100,000) and format used by all Federal and State geological surveys. Geologic maps at a scale of 1:24,000 are appropriate for development of data for archiving or for resolution of special problems, and for compilation as part of 1:100,000-scale published maps.

### 2. Mapping Priorities

- a. Priorities for investigation within a State are determined by each State geological survey through internal mechanisms, including State geologic mapping advisory committees, that identify specific intra-State needs.
- b. Determination of State investigations to be supported from among all proposals made to the STATEMAP component will be by a peer-review panel (Item 111.B.3.b above).

### 3. Investigation Implementation

- a. The component will produce geologic map information to meet standards and formats common to all Federal and State geological surveys.

- b. State geological surveys will publish the geologic map data resulting from investigations in the STATEMAP component. State surveys can contract with the USGS to publish geologic map data developed in the Program. Cost of publication will be included in the funding proposal.

#### 4. Funding

- a. Line item appropriation from the U. S. Congress to the USGS that will coordinate the nationwide program through cooperative agreements with States. The USGS retains only administrative overhead costs necessary for managing the Program. Such costs can be reviewed by the Advisory Committee (Item 111.8.2, above).
- b. Distribution of funds to States shall be determined by priorities established by the process described in item IV.C.2, above.
- c. State geological surveys shall match Federal funds with non-Federal funds.